
Technical notes

Saignée – do the benefits outweigh the costs?

Since 2016 the AWRI has conducted annual winemaking trials where a single batch of grapes is divided into smaller lots and one winemaking variable is changed in each fermentation. A range of wines with differing sensory qualities are produced and then presented at tasting workshops staged across Australia. One of the treatments included in the trials to date (Pinot Noir in 2016, Shiraz in 2017 and Cabernet Sauvignon in 2019) is saignée. This article reviews some of the literature on this technique and considers its pros and cons.

Defining saignée

The French word saignée means ‘bleeding’. In a winemaking context this refers to bleeding off or draining juice from a fermenter shortly after crushing, with the aim of increasing the concentration of phenolic compounds in the wine. The technique is almost exclusively used in red winemaking and has a concentrating effect because it increases the ratio of skins to juice in the fermentation. In some studies saignée has been used to simulate winemaking with smaller berries (which also results in an increased ratio of skins to juice compared to winemaking with larger berries), although it has subsequently been shown not to be a valid comparison (Walker et al. 2005). The origins of the technique are unclear, with apparently no reference to it in early French texts.

Varieties and the quantity of juice to drain off

Saignée can be used with any red grape variety but is most commonly associated with Pinot Noir. It is likely to have the greatest positive effect when working with large berries; for example, where rain close to harvest has caused them to swell. In this scenario, however, any negative attributes, such as off-flavours caused by moulds, may also be concentrated. Around 10 to 20% juice removal is common; however, the effects of saignée reported in the literature are markedly inconsistent. While some studies show positive results with as little as 10% juice removal (Singleton 1972), Gerbaux (1993) working with Burgundian Pinot Noir over five vintages reported negligible changes in the polyphenol profile or quality of wines when up to 20% of juice was removed.

Economic and practical considerations

Saignée performed at a rate where a positive result may be expected will result in a marked loss of wine volume. Wine producers should therefore carefully consider the cost-benefit ratio and satisfy themselves that any increase in positive wine attributes adequately compensates for the loss of wine volume. The economics are enhanced if value can be added to the drained-off juice by incorporating it into other wines, and its use for making rosé is common. When using

drained-off juice for rosé, winemakers may wish to wait until some colour and tannin has been extracted from the grape skins early in fermentation before draining off the juice, noting that this may partially negate the concentration effect in the original ferment. Anecdotal observations suggest that if juice is drained from the bottom of a fermenter, particularly after the skins have risen, a substantial proportion of seeds that have settled to the bottom of the tank may also be removed with the drained-off juice. If considered desirable, those seeds may be easily separated and discarded by racking the drained-off juice. However, the removal of seeds from the original fermenter may also have a marked effect on the phenolic profile and sensory characteristics of that wine, and if that is considered undesirable, the seeds may be added back to that fermenter.

Changes in wine composition and their relation to the amount of juice removed

Alcohol and acids seem to be largely unaffected by saignée, although a small increase in pH is often reported. The most important compositional changes are increases in anthocyanins and other phenolics, with additional seed- and skin-derived tannins being extracted in equal proportions (Casassa et al. 2016). However, while several studies examine the extraction and fate of anthocyanins and other phenolics during fermentation, at pressing and at bottling, and conduct sensory evaluation over a timeframe of up to one year, there appear to be no studies that examine the compositional or sensory effects of saignée over the medium to longer term.

It might be expected that increases in anthocyanins and other phenolics would be proportional to the percentage of juice drained off; however, marked inconsistency is evident between studies. In general, an increase in anthocyanins and tannins is seen with saignée, but not universally, and in several studies the effects are marginal and may be of little oenological or sensory consequence. Singleton (1972) examined nine grape varieties, with 10% of juice being drained from some fermenters and 10% added to others. With all but one variety, corresponding ~10% increases or decreases in both anthocyanins and other phenolic compounds were reported, compared to a non saignée/non-juice added back control. Similarly, Harbertson et al. (2009), working with Merlot, saw an 18% increase in tannin concentration with 16% juice run-off. However, Casassa et al. (2016) reported increases of 22% in anthocyanins and a 24% in tannins with 16% juice-run-off, on day five of Cabernet Sauvignon fermentations, whereas Wu et al. (2017) working with the same variety, reported a 9% increase in anthocyanins and a 4% increase in non-anthocyanin phenolics, with 14% juice run-off.

Factors which influence the amount of colour and tannin extracted

Fruit source and seasonal variabilities are the key factors which influence the magnitude of phenolic extraction when using saignée. Gawel et al. (2001), working with Shiraz from two Hunter Valley vineyards during the same vintage, observed differences in phenolic extraction between the vineyards with both 10% and 20% saignée. Bautista-Ortín et al. (2004) reported marked differences in extraction with Mataro from a single vineyard between two consecutive seasons, for both 15% and 20% saignée wines. Those differences were primarily attributed to seasonal differences in berry size. Zamora et al. (1994), working with 31% saignée in Malbec from a single vineyard in the Cahors region of France, reported higher concentrations of polymeric pigments and tannins in the saignée wines compared to control wines, for each of three consecutive vintages. However, among the three years there was a 2.8-fold difference in the size of the increase in polymeric pigments, and a 2.4-fold difference in the size of the increase in tannins, with total anthocyanins only higher in the saignée wine in the first two seasons, with a small decrease compared to the control wine seen in the third year.

The stability of changes in phenolic profile over time

It is normal for the concentration of anthocyanins to decline in any wine after pressing, and this is seen in all saignée studies in both control and saignée wines. However, the greatest reductions are often seen in treatments with the highest anthocyanin concentrations at pressing. Consequently, in several studies the concentrations of anthocyanins across various treatments tended to converge over time. Casassa et al. (2016) reported that after 120 days anthocyanins had decreased by 32% in control wines and by 43% in saignée wines, resulting in little difference in anthocyanin concentrations at that point. Tannins, though, behave differently, with the initial increase in tannins in the Casassa et al. (2016) study persisting to 120 days. Wu et al. (2017) report a 46% reduction in anthocyanins in both control and 14% saignée Cabernet Sauvignon wines after one year, but only 13% and 8% reductions in non-anthocyanin phenolics in the control and the saignée wines respectively over the same timeframe. Baiano et al. (2009) reported a 6.2% decrease in total phenolics after one year of ageing Primitivo wines which had undergone 33% saignée, with Gawel et al. (2001) reporting decreases in both anthocyanins and total phenolics up to 180 days in 10% and 20% saignée wines from two vineyards. Casassa et al. (2016) state that the reasons for the transient effect of saignée on anthocyanin concentration remain speculative.

Sensory changes

Despite the analytical differences between saignée and non-saignée wines being small or sometimes barely detected following an ageing period of as little as six months, some studies demonstrate that nonetheless, differences can often be perceived organoleptically. Saignée

wines have variously been considered superior to non-saignée controls for variables including red colour, aroma and perceived tannin concentration (Gawel et al. 2001, Singleton 1972). However, Fanzone et al. (2013), working with Malbec for two vintages and 10%, 20% and 30% juice-runoff, found that trained sensory panellists could not differentiate the saignée wines from a non-saignée control during triangular tests, despite the saignée wines displaying increased colour intensity and total phenolics. Additionally, Singleton (1972) noted that although his study revealed increases in some phenolic compounds that were relatively proportional to the quantity of juice drained off (or added back), sensory panel ratings for a range of wine attributes did not follow the same relationship.

Summary

Aside from the overall loss of wine volume, there are few risks associated with using saignée, except for its potential to result in the over-extraction of tannins which may lead to excess astringency, or to concentrate any negative attributes that may be present in the grapes. However, the results of using the technique are inconsistent and may be influenced by many factors, particularly the fruit source and the season. A decision on whether to use saignée should therefore be made on a case-by-case basis. Additionally, the magnitude of positive compositional differences in saignée wines appears to diminish over time, and in the absence of studies which follow wines analytically and sensorially over the medium to longer term, there is no clear evidence that any benefits are other than transient. Consequently, producers should carefully evaluate the cost-benefit ratio, and be satisfied that any changes are of sufficient magnitude to outweigh the marked loss of wine volume, noting that relatively small compositional and sensory differences are often evident, relative to the quantity of juice removed. It should also be noted that while oak ageing might be an important factor in evaluating the efficacy of saignée in the medium to longer term, there appear to be no studies which examine this variable. As with all winemaking changes, it is recommended that wine producers take a cautious approach, trialling small batches in the first instance, and evaluating the effects over time.

Acknowledgements

This work was supported by Australia's grapegrowers and winemakers through their investment body, Wine Australia, with matching funds from the Australian Government. The AWRI is a member of the Wine Innovation Cluster in Adelaide, South Australia. Michael Downie and Melissa Francis are thanked for their assistance in finding and acquiring information resources for this article.

References

Baiano, A., Terracone, C., Gambacorta, G., La Notte, E. 2009. Phenolic content and antioxidant activity of Primitivo wine: comparison among winemaking technologies. *J. Food Sci.* 74(3): 258–267.

Bautista-Ortín, A.B., Fernández-Fernández, J.I., López-Roca, J.M., Gómez-Plaza, E. 2004. Wine-making of high coloured wines; extended pomace contact and run-off juice prior to fermentation. *Food Sci. Tech. Int.* 10(5): 287–295.

Casassa, L.F., Larsen, R.C., Harbertson, J.F. 2016. Effects of vineyard and winemaking practices impacting berry size on evolution of phenolics during winemaking. *Am. J. Enol. Vitic.* 67(3): 257–268.

Fanzone, M., Peña-Neira, Á., Jofré, V., Assof, M., Zamora, F. 2013. Efecto de la técnica sangrado sobre la composición fenólica de vinos cv. Malbec. *Rev. FCA UNCUYO.* 45(1): 199–209.

Gawel, R., Iland, P.G., Leske, P.A., Dunn, C.G. 2001. Compositional and sensory differences in Syrah wines following juice runoff prior to fermentation. *J. Wine Res.* 12:5–18.

Gerbaux, V. 1993. Étude de quelques conditions de cuvaison susceptibles d'augmenter la composition polyphénolique des vins de Pinot Noir. *Rev. Oenol.* 69: 15–18

Harbertson, J.F., Mirelas, M.S., Harwood, E.D., Weller, K.M., Ross, C.F. 2009. Chemical and sensory effects of saignée, water addition, and extended maceration on high Brix must. *Am. J. Enol. Vitic.* 60(4): 450–460.

Singleton, V.L. 1972. Effects on red wine quality of removing juice before fermentation to simulate variation in berry size. *Am. J. Enol. Vitic.* 23(3): 106–113.

Walker, R.R., Blackmore, D.H., Clingeffer, P.R., Kerridge, G.H., Rühl, E.H., Nicholas, P.R. 2005. Shiraz berry size in relation to seed number and implications for juice and wine composition. *Aust. J. Grape Wine Res.* 11(1): 2–8.

Wu, Y., Xing, K., Zhang, X., Wang, H., Wang, F., Wang, Y., Li, J. 2017. Effect of pre-fermentation saignée treatment on phenolic compound profile in wine made of Cabernet Sauvignon. *J. Food Biochem.* 41(4): 1–10.

Zamora, F., Luengo, G., Margalef, P., Magriña, M., Arola, L. 1994. Nota. Efecto del sangrado sobre el color y la composición en compuestos fenólicos del vino tinto. *Rev. Esp. Cienc. Tecnol. Aliment.* 34: 663–671.

Peter Godden, Manager – Industry Engagement and Application, *peter.godden@awri.com.au*